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Our Ref: 2242/K.Z

12 September 2016

Xiamen Hopergy Photovoltaic Technology Co. Ltd.
No.630, Tonghong Road
Tongan District, Xiamen 361100
China

PV Array Frame Engineering Certification

Installation of Hopergy Tin Roof Flush Mount Solar System with HOP-SLR03 Rails

Gamcorp (Melbourne) Pty Ltd, being Structural Engineers within the meaning of Australian and New Zealand Building Regulations, have carried out a structural design check of Hopergy Tin Roof Flush Mount Solar System installation within Australia and New Zealand. The design check has been based on the information in the schematic drawings of the system components provided by Hopergy Australia (IMSOLAR).

We find the Installation of Hopergy Tin Roof Flush Mount Solar System for Australian and New Zealand use to be structurally sufficient based on the following conditions:

- Wind loads to AS/NZ1170.2:2011 Admt 3:2013
- Wind region A, B, C, D, W
- Wind terrain category 2 & 3
- Wind average recurrence interval of 500 years
- Maximum building height 20m
- The PV panel dimensions to be 1640mm x 992mm and 2000mm x 1000mm
- Maximum weight of the PV panel and array frame to be 15 kg/m²
- Rails to be HOP-SLR03
- Rails material to be aluminium graded AL6005-T5 or higher
- The tin roof interface to be L-feet bracket or T-feet bracket as per drawing HOP-TRB01-38
- The assessment is based on an assumption that the interface brackets capacity meet the industrial standard requirements
- Each PV panel to be installed using 2 rails minimum in all circumstances
- Installation of PV array to be done in accordance with the PV installation manual
- The certification **excludes** assessment of roof structure and PV panels

Refer to attached summary table for interface spacing

NOTES:

- **The recommended spacing nominated in this certification is based on the capacity of the array frame, not the roof structure and PV panel. It is the responsibility of the installer to adopt the most critical spacing.**

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- **If any of the above conditions cannot be met, the structural engineer must be notified immediately.**

Construction is to be carried out strictly in accordance with the manufacturers instructions. This work was designed in accordance with the provisions of Australian and New Zealand Building Regulations and in accordance with sound, widely accepted engineering principles.

Yours faithfully,
Gamcorp (Melbourne) Pty Ltd



Martin Gamble
Managing Director
MAICD



Mudi Ariyaratna
B.Eng(Civil)(Hons)Monash, M.Eng&Mgt, MIEAust,
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Gamcorp (Melbourne) Pty Ltd
Consulting Structural & Civil Engineers
A.C.N 141 076 904
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Structural Design Documentation

Tin Roof Flush Mount Racking System Interface Spacing Table According to AS/NZS 1170.2-2011 Amdt 3-2013 with HOP-SLR03 Rails within Australia & New Zealand Terrain Category 2 & 3

For: Xiamen Hopergy Photovoltaic
Technology Co. Ltd.



Job Number: 2242
Date: 12 September 2016

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ISO 9001:2008 Registered Firm
Certificate No: AU1222

Job No: 2242

Client: Xiamen Hopergy Photovoltaic Technology Co. Ltd.

Project: Flush Mount Interface Spacing Table for Tin Roof

Address: within Australia & New Zealand

Australian/New Zealand Standards

AS/NZS 1170. 2011 – Structural Design Actions

Part 0 – General Principles

Part 1 – Permanent imposed and other actions

Part 2 – Wind Actions

Part 3 – Snow and Ice Actions

AS/NZS 1252 – High Strength Structural Bolting

AS 4055 – Wind Loads for Housing

AS 4100 – Steel Structures

AS/NZS 4600 – Cold-Formed Steel Structures

Wind Terrain Category:

WTC 2 & 3

Designed: K.Z

Date: Sep-16

Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.**
 Project: **Flush Mount Interface Spacing Table for Tin Roof**
 Address: **within Australia & New Zealand**
 Designer **K.Z**

Job: **2242**
 Date: **Sep-16**

Checked: **M.A**

Flush Mount Interface Spacing Table for Tin Roof

Type of Rail HOP-SLR03
 Type of Interface Tin Interface Bracket
 Solar Panel Dimension 1.64m x 0.99m
Terrain category 2

Roof Angle (Φ) – 5° - 10°

Wind Region	Building Height - H (m)							
	H≤10		10<H≤15		15<H≤20			
	D.W & U.W	Central		D.W & U.W	Central		D.W & U.W	Central
A	1531	1673		1491	1628		1468	1602
B	1348	1468		1314	1430		1295	1409
C	1216	1321		1186	1288		1168	1269
D	1078	1170		1052	1141		1037	1125
W	1431	1560		1394	1519		1373	1496

Roof Angle (Φ) – 11° - 20°

Wind Region	Building Height - H (m)							
	H≤10		10<H≤15		15<H≤20			
	D.W & U.W	Central		D.W & U.W	Central		D.W & U.W	Central
A	1434	1572		1397	1530		1376	1507
B	1266	1383		1234	1348		1216	1328
C	1142	1246		1114	1215		1098	1198
D	1014	1105		989	1078		975	1062
W	1342	1468		1308	1430		1288	1408

D.W & U.W – Downwind and Upwind refer to note 6.

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 Address: **within Australia & New Zealand**
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 Date: **Sep-16**

Checked: **M.A**

Roof Angle (Φ) – 21° - 30°

Wind Region	Building Height – H (m)							
	H≤10		10<H≤15		15<H≤20			
	D.W & U.W	Central		D.W & U.W	Central		D.W & U.W	Central
A	1463	1531		1425	1491		1404	1468
B	1290	1348		1258	1314		1239	1295
C	1164	1216		1136	1186		1119	1168
D	1033	1078		1008	1052		993	1037
W	1368	1431		1333	1394		1314	1373

Roof Angle (Φ) – 31° - 60°

Wind Region	Building Height – H (m)							
	H≤10		10<H≤15		15<H≤20			
	Intermedi ate	Internal		Intermedi ate	Internal		Intermedi ate	Internal
A	1539	1682		1498	1649		1476	1630
B	1355	1511		1320	1471		1301	1449
C	1222	1359		1191	1324		1174	1305
D	1083	1202		1057	1172		1034	1156
W	1438	1597		1401	1563		1380	1539

D.W & U.W – Downwind and Upwind refer to note 6.

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 Address: **within Australia & New Zealand**
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Checked: **M.A**

Flush Mount Interface Spacing Table for Tin Roof

Type of Rail HOP-SLR03
 Type of Interface Tin Interface Bracket
 Solar Panel Dimension 1.64m x 0.99m
Terrain category 3

Roof Angle (Φ) - 5° - 10°

Wind Region	Building Height - H (m)									
	H \leq 10				10<H \leq 15					
	D.W & U.W	Central			D.W & U.W	Central				
A	1699	1866			1633	1790			1584	1734
B	1490	1627			1435	1565			1393	1518
C	1340	1459			1292	1406			1256	1365
D	1187	1289			1145	1243			1113	1208
W	1584	1733			1524	1665			1479	1615

Roof Angle (Φ) - 11° - 20°

Wind Region	Building Height - H (m)									
	H \leq 10				10<H \leq 15					
	D.W & U.W	Central			D.W & U.W	Central				
A	1588	1747			1528	1678			1483	1627
B	1396	1529			1345	1472			1307	1429
C	1258	1375			1213	1325			1179	1287
D	1115	1216			1076	1173			1046	1140
W	1482	1626			1427	1564			1386	1518

D.W & U.W - Downwind and Upwind refer to note 6.

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Roof Angle (Φ) – 21° - 30°

Wind Region	Building Height - H (m)							
	H≤10		10<H≤15		15<H≤20			
	D.W & U.W	Central		D.W & U.W	Central		D.W & U.W	Central
A	1621	1699		1559	1633		1513	1584
B	1424	1490		1372	1435		1333	1393
C	1283	1340		1237	1292		1202	1256
D	1137	1187		1097	1145		1066	1113
W	1512	1584		1456	1524		1414	1479

Roof Angle (Φ) – 31° - 60°

Wind Region	Building Height - H (m)							
	H≤10		10<H≤15		15<H≤20			
	Intermedi ate	Internal		Intermedi ate	Internal		Intermedi ate	Internal
A	1671	1810		1624	1762		1586	1725
B	1497	1648		1442	1601		1400	1563
C	1347	1502		1298	1446		1262	1404
D	1192	1325		1150	1278		1118	1242
W	1586	1724		1531	1676		1487	1639

D.W & U.W – Downwind and Upwind refer to note 6.

Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.**
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 Address: **within Australia & New Zealand**
 Designer **K.Z**

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 Date: **Sep-16**

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Flush Mount Interface Spacing Table for Tin Roof

Type of Rail HOP-SLR03
 Type of Interface Tin Interface Bracket
 Solar Panel Dimension 2m x 1m
Terrain category 2

Roof Angle (Φ) - 5° - 10°

Wind Region	Building Height - H (m)							
	H≤10		10<H≤15		15<H≤20			
	D.W & U.W	Central		D.W & U.W	Central		D.W & U.W	Central
A	1457	1592		1419	1549		1397	1525
B	1283	1397		1250	1361		1232	1340
C	1157	1257		1128	1226		1112	1208
D	1026	1113		1001	1086		986	1070
W	1361	1484		1326	1445		1307	1423

Roof Angle (Φ) - 11° - 20°

Wind Region	Building Height - H (m)							
	H≤10		10<H≤15		15<H≤20			
	D.W & U.W	Central		D.W & U.W	Central		D.W & U.W	Central
A	1365	1496		1330	1456		1310	1434
B	1204	1316		1174	1282		1157	1263
C	1087	1186		1060	1156		1045	1140
D	965	1051		932	1025		906	1011
W	1277	1397		1244	1361		1226	1340

D.W & U.W - Downwind and Upwind refer to note 6.

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 Address: **within Australia & New Zealand**
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Roof Angle (Φ) – 21° - 30°

Wind Region	Building Height – H (m)							
	H≤10		10<H≤15		15<H≤20			
	D.W & U.W	Central	D.W & U.W	Central	D.W & U.W	Central		
A	1392	1457	1356	1419	1336	1397		
B	1228	1283	1197	1250	1179	1232		
C	1108	1157	1081	1128	1065	1112		
D	983	1026	959	1001	941	986		
W	1302	1361	1269	1326	1250	1307		

Roof Angle (Φ) – 31° - 60°

Wind Region	Building Height – H (m)							
	H≤10		10<H≤15		15<H≤20			
	Intermedi ate	Internal	Intermedi ate	Internal	Intermedi ate	Internal		
A	1464	1601	1426	1569	1404	1551		
B	1289	1438	1257	1400	1238	1379		
C	1163	1293	1134	1260	1117	1242		
D	1031	1144	1005	1116	991	1100		
W	1368	1520	1333	1488	1313	1465		

D.W & U.W – Downwind and Upwind refer to note 6.

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Flush Mount Interface Spacing Table for Tin Roof

Type of Rail: HOP-SLR03
 Type of Interface: Tin Interface Bracket
 Solar Panel Dimension: 2m x 1m
Terrain category: 3

Roof Angle (Φ) - 5° - 10°

Wind Region	Building Height - H (m)							
	H ≤ 10				10 < H ≤ 15			
	D.W & U.W	Central			D.W & U.W	Central		
A	1617	1776			1554	1703		
B	1418	1548			1365	1489		
C	1276	1389			1230	1338		
D	1129	1227			1089	1183		
W	1507	1649			1450	1584		

Roof Angle (Φ) - 11° - 20°

Wind Region	Building Height - H (m)							
	H ≤ 10				10 < H ≤ 15			
	D.W & U.W	Central			D.W & U.W	Central		
A	1511	1662			1454	1597		
B	1329	1455			1280	1401		
C	1197	1308			1155	1261		
D	1061	1157			1024	1116		
W	1410	1547			1358	1489		

D.W & U.W - Downwind and Upwind refer to note 6.

Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.**
 Project: **Flush Mount Interface Spacing Table for Tin Roof**
 Address: **within Australia & New Zealand**
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Job: **2242**
 Date: **Sep-16**

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Roof Angle (Φ) – 21° - 30°

Wind Region	Building Height - H (m)							
	H≤10		10<H≤15		15<H≤20			
	D.W & U.W	Central		D.W & U.W	Central		D.W & U.W	Central
A	1542	1617		1484	1554		1440	1507
B	1355	1418		1306	1365		1268	1326
C	1221	1276		1177	1230		1144	1195
D	1082	1129		1043	1089		1015	1059
W	1439	1507		1386	1450		1346	1408

Roof Angle (Φ) – 31° - 60°

Wind Region	Building Height - H (m)							
	H≤10		10<H≤15		15<H≤20			
	Intermedi ate	Internal		Intermedi ate	Internal		Intermedi ate	Internal
A	1590	1722		1545	1677		1510	1641
B	1425	1568		1372	1523		1332	1487
C	1282	1429		1236	1376		1201	1336
D	1135	1261		1094	1216		1064	1182
W	1509	1641		1457	1595		1415	1560

D.W & U.W – Downwind and Upwind refer to note 6.

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 Address: **within Australia & New Zealand**
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General Notes				
Note 1	Screws minimum embedment length into timber 35 mm			
Note 2	Recommended screws			
	Metal Purlins/Battens	Fasteners to use		
	0.55 mm – 1.5 mm	M6-11 TPI RoofZips		
	1.9 mm	M6-11 TPI RoofZips OR 14g-10 TPI Tek screws		
	2.4 mm and Above	14g-10 TPI Tek screws		
	Wood purlins and Rafter	Fasteners to use		
	Pine and Hardwood (35mm embedment and above)	M6-11 TPI RoofZips OR 14g-10 TPI		
Note 3	Above Spacing calculated based on 1.9mm steel purlin OR F17 Hardwood For Wind region C & D spacing for Tin Roof should be reduced as follows,			
	Material	Wind Region C		Wind Region D
		Central	D.W & U.W	Central D.W & U.W
	0.55 mm steel Batten	22%	25%	30% 42%
	0.75 mm steel Batten	0%	0%	10% 5%
Note 4	Following components are satisfied to use according to AS/NZS 1170.2-2011 Amdt 3-2013			
	Components	Part Number	Description	
	HOP-SLR03 Rail	HOP-SLR03	HOP-SLR03 Rail	
Note 5	<p>Terrain category 2 (TC2) refers to open terrain, including grassland, with well-scattered obstructions having heights generally from 1.5 m to 5 m, with no more than two obstruction per obstructions per hectare.</p> <p>Terrain category 3(TC3) refers to numerous closely spaced obstructions having heights generally from 3 m to 10 m. For example suburban housing or light industrial estates. Refer clause 4.2.1 of AS/NZS 1170.2-2011 Amdt 3-2013 for definition of Terrain category 3.</p>			
Note 6	For the definition of Downwind, Upwind end and central, refer figure D9 from AS/NZS 1170.2-2011 Amdt 3-2013.			